JETLINER ALERT SYSTEMS

For years, jetliner cockpits have been getting more complicated, due to more complex on-board systems and increasing regulatory requirements; this is particularly true of systems that alert crews to malfunctions or other hazards. American manufacturers are taking steps to halt that trend. The newest transports, including the Boeing 757 and 767 (right) and the McDonnell Douglas DC-9 Super 80, incorporate technology designed to reduce the complexity of crew alerting systems. Several years of research and design verification, by aircraft manufacturers, the Federal Aviation Administration and NASA, preceded the 1981–83 introduction to service of these jetliners.

Shown above is the flight deck of the Boeing 757, in the exact center of which is the primary display panel for the Engine Indication and Crew Alerting System (EICAS). The EICAS system automatically monitors more than 400 inputs from sensors and provides three levels of alert messages: warning, when a condition requires immediate crew action; caution, when immediate crew awareness and future action is required; and advisory, for conditions that require crew awareness and possible future action. Written messages appear on the EICAS displays in different colors, according to alert category: red for warning, amber for caution and advisory. Aural alerts on the 757 are signaled by bells, sirens, caution beepers and, in some cases, synthetic voice messages; the 757 employs voice alerts only for ground proximity messages and relies on the centralized visual displays for most alerts. The DC-9 Super 80 features expanded use of voice alerts. Generally, advanced systems like EICAS are designed to reduce alert ambiguity, to order alerts by priority and to put visual displays where they are best viewed by both pilots to assure earliest awareness.

Almost a decade ago, Ames Research Center pioneered research in cockpit applications for computer-controlled voice synthesizers capable of constructing messages from basic speech sounds. To help pilots monitor several flight parameters during difficult landing approaches, Ames developed experimental systems for synthesized voice readout of altitude, airspeed, descent rate and deviation from flight path. Concurrently, Ames was researching the human factors associated with crew alert systems, such as defining the pilots' field of view to aid placement of visual displays, study of flight deck background noise that might interfere with aural alerts, and other considerations of the most effective ways to advise crews of problems. Ames expertise was made available to aircraft manufacturers, providing contributions in synthetic voice alert criteria and human factors guidelines for alert systems in general.